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CHECK TEST OF LAUNCHER, GRENADE, 40MM, M203 UNDER ARCTIC WINTER CONDITIONS

FINAL REPORT

BY

BENJAMIN P. OWEN
MAJ, IN
14 April 1975

U. S. ARMY ARCTIC TEST CENTER

APO SEATTLE 98733

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The U.S. Army Arctic Test Center conducted a Check Test of an Improved Launcher, Grenade, 40mm, M203 under arctic winter conditions at Fort Greely, AK, from 20 Nov 74 to 26 Feb 75. The purpose of the test was to evaluate improvements intended to correct previously reported problems related to guide rails, handgrips, and primer punchouts. The test was conducted at ambient temperatures varying from -4°F to -64°F in a variety of typical arctic field locations. A total of 1000 rounds of 40mm, M433, HEDP ammunition was fired from each of five improved

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Block 20 (Cont'd).

M203 launchers. Testing consisted of: Preoperational Inspection, transportability and handling, maintenance evaluation, reliability, and adequacy of corrective actions. Cold weather performance characteristics of the 40mm, M433, HEDP ammunition were recorded and reported for information only.

It was concluded that the previously reported problems had been corrected and that the improved M203 launcher can be operated successfully in the arctic winter environment.

It was recommended that the improved M203 launcher be considered acceptable for use in the Arctic.

DEPARTMENT OF THE ARMY
HEADQUARTERS U. S. ARMY TEST AND EVALUATION COMMAND
ABERDEEN PROVING GROUND, MARYLAND 21005

AMSTE-IN

21 MAY 1975

SUBJECT: Evaluation for Check Test of Launcher, Grenade, 40mm, M203, Under Arctic Winter Conditions, TECOM Project No. 8-WE-300-203-019

Commander
US Army Armament Command
ATTN: AMSAR-ASI
Rock Island, Illinois 61201

1. References.

a. Letter, AMSTE-BC, TECOM, 20 Jul 71, subject: Suitability for Use of Grenade Launcher, 40MM, M203, Under Arctic Winter Environmental Conditions, USATECOM Project No. 8-WE-300-203-002.

b. Letter, STEAC-PL-TSA, USAATC, 1 Mar 73, subject: Letter Report of Check Test of Launcher Grenade, 40MM, M203, Under Arctic Winter Conditions, TECOM Project No. 8-WE-300-203-015.

2. Approval Statement. The inclosed report is approved.

3. Background.

a. The US Army Arctic Test Center conducted a service test of the Launcher, Grenade, 40mm, M203, under arctic winter conditions during the 1970-1971 arctic test season. Two deficiencies and two shortcomings were reported. Deficiencies were (1) Fracture of the barrel guide rail during firing, and (2) Failure of the adhesive bond between the handguard and the barrel. Shortcomings were (1) Lack of durability of the quadrant sight, and (2) Lack of complete instructions for removal of the breech insert. Numerous primer punchouts resulting in failure to fire were reported.

b. After corrective improvements had been made, TECOM initiated a check test in the 1972-1973 arctic test season. During the test, 152 primer punchouts occurred in firing 449 rounds. Because of the frequency of occurrence, the primer punchout problem was classified as a deficiency and testing was suspended.

c. Design reevaluation resulted in modification to the firing pin to correct the problem. Check test was reinitiated during the 1974-1975 arctic test season in accordance with the TECOM-approved test plan. The inclosed report provides the results of that testing.

4. Materiel Description.

a. The improved Launcher, Grenade, 40mm, M203, is a lightweight, single-shot, breech loading, pump action, shoulder-fired weapon and is attached to the M16A1 Rifle. The launcher is loaded by inserting a 40mm round in the open breech and pulling the barrel rearward to the locked position. The pump-operated mechanism is moved on two L-shaped rails on the underside of the weapon housing. The launcher is capable of firing all standard 40mm ammunition designed for a single shot weapon.

b. A leaf-type battle sight is mounted on the top of the rifle as part of the handguard assembly. It has range graduations from 50 to 250 meters and is used in conjunction with the front sight post of the M16A1 rifle to obtain a sight picture. The quadrant sight is attached to the rifle handle and is graduated from 50 to 400 meters. It consists of a sight arm, a range selection quadrant and mounting brackets. Primarily, this sight is used to engage targets from 300 to 400 meters.

5. Scope of Test. This check test was conducted by the US Army Arctic Test Center from 20 November 1974 to 26 February 1975 to determine if modifications had corrected the previously reported deficiencies and shortcomings. Five launchers, each firing 1,000 rounds, were tested in temperatures from -4°F to -64°F to evaluate mission reliability, maintenance, transportability and human factors. Although ammunition performance was not a specific objective of the test, pertinent observations were made and recorded in the report.

6. Technical Assessment.

a. Overall Assessment. Overall launcher performance under arctic winter conditions was satisfactory and reliable. The launcher withstood rough handling under conditions similar to that which might be expected during shipment and in combat. Repair parts provisioning was consistent with the maintenance allocation chart and they were interchangeable with like parts being replaced.

b. Detailed Assessment.

(1) No new deficiencies or shortcomings were encountered.

(2) Previously reported deficiencies have been corrected.

(a) No failures or difficulties were encountered with guide rails or hand grips during the test.

(b) No primer punchouts were encountered in the 5,000 rounds fired during the test. Firing pin protrusion on all test launchers was within established tolerance and no change was noted throughout the test.

(3) With mission reliability stated in terms of the capability to fire 10 rounds in two minutes, 500 mission trials were conducted. There were no failures. The true reliability for a success/failure type mission, with 90 percent confidence, was at least 0.9954 (failure distribution assumed to be binomial). The average time to fire a ten-round mission was one minute and sixteen seconds.

(4) Safety. Although the high pressure chamber in the cartridge case fractured in 45 of 5,000 firings, the launcher is safe to fire from the shoulder. One fragment was expelled from the muzzle and travelled down range for a distance of 5.5 meters. The fragment stayed within the safety zone. The condition is not considered a safety hazard based on this occurrence; however, it is obviously an undesirable condition and has not previously been observed or reported.

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(5) Equipment publications were not evaluated at each level of maintenance. Publications were adequate for operator maintenance. Common tools were used satisfactorily for all repair actions. Evaluation was not made of the special tool (wrench adapter, torque) used for removal of the breech insert because insert removal is not performed at operator level and the operation was not necessary or performed in this test.

7. Conclusions.

a. Previously reported deficiencies have been corrected.

b. The improved Launcher, Grenade, 40mm, M203, can be operated successfully under arctic winter conditions.

FOR THE COMMANDER:

William H. Tucker, Jr

1 Incl
ATC Rept (TECOM Proj
8-WE-300-203-019)

WILLIAM H. TUCKER, JR
Colonel, GS
Dep to the CG for Testing

SUMMARY

RESULTS

a. No recurrences of previously reported deficiencies related to guide rails, handgrips, and primer punchouts occurred during testing.

b. The Improved Launcher, Grenade, 40mm, M203 met four of six criteria. The remaining two criteria were not fully evaluated.

c. Those criteria which were met concerned transportability and handling (para 2.2.5a), repair parts (para 2.3.2.5), repair parts interchangeability (para 2.3.2.5), and reliability (para 2.4.5b).

d. The two criteria which were not fully evaluated concerned equipment publications (para 2.3.1.5) and special tools (para 2.3.3.5).

CONCLUSIONS

a. The previously reported deficiencies have been corrected.

b. The Improved Launcher, Grenade, 40mm, M203 can be operated successfully in an arctic winter environment.

RECOMMENDATIONS

It is recommended that:

a. The Improved Launcher, Grenade, 40mm, M203 be considered acceptable for use in the Arctic.

b. The changes to publications on the launcher recommended in para 2.3.1.4b and c be adopted.

FOREWORD

The Arctic Test Center, Fort Greely, Alaska, was responsible for test planning, execution, and reporting of this test. Meteorological support was provided by the Atmospheric Science Lab's Alaska MET Team. The test team from Weapons System Test Branch responsible for conducting the test consisted of the following personnel:

a. Test Officer - MAJ B. P. Owen, Infantry (ATC).

b. Test NCO - SFC J. O. McCarver (ATC).

c. Firing Team.

Grenadier - SGT C. L. Johnson (A Co, 1/60 Inf) (TDY)*
Grenadier - SP4 K. W. Humbard (B Co, 1/60 Inf) (TDY)*
Grenadier - SP4 J. L. Tablada (C Co, 1/60 Inf) (TDY)*
Grenadier - SP4 D. W. Leach (A Co, 1/60 Inf) (TDY)*
Grenadier - PFC G. McElhaney (B Co, 1/60 Inf) (TDY)*

d. Support Team.

Recorder - SP4 H. Cannon (ATC).
Ammo Handler - SP4 L. G. McTarsney (ATC).
Medic - SP4 B. Parker (HHC, 4/9 Inf) (TDY).

*TDY soldiers were from 172nd Arctic Light Infantry Brigade (Airmobile).

TABLE OF CONTENTS

SECTION 1 - INTRODUCTION

1.1 BACKGROUND

a. In June 1967, a small development requirement for a 40mm detachable grenade launcher for rifles was approved by the Assistant Chief of Staff for Force Development. The purpose of the requirement was to provide rifle squad grenadiers with the capability of engaging point as well as area targets, thereby adding, in effect, two additional riflemen to the current rifle squad.

b. An Engineering Design Test for the Launcher, Grenade, 40mm, M203, was conducted at Aberdeen Proving Ground (APG) and Fort Benning in August 1968. Engineering tests at APG, in 1969, revealed handgrip adhesive and primer punchout problems which were to be corrected. The launcher underwent an Arctic Service Test during the FY71 test season. The launcher was found unsuitable for arctic use due to two deficiencies (ref 1, appendix I). The deficiencies were:

(1) Fracture of the barrel guide during firing.

(2) Failure of the adhesive bond between the handguard and the barrel.

c. The developer indicated that corrective action had been taken and a product improvement test of a new sight was conducted by the Infantry Board. A check test under arctic winter conditions, using M406, HE, ammunition, was initiated by the Arctic Test Center (ATC) on 10 November 1972. The test was terminated on 2 Feburary 1973 pending design reevaluation and a product modification to correct primer punchout problems (ref 2, appendix I).

d. In September 1974, ATC was directed to conduct a check test of the Launcher, Grenade, 40mm, M203 under arctic winter conditions during FY75 (ref 3, appendix I).

1.2 DESCRIPTION OF MATERIEL

a. The improved Launcher, Grenade, 40mm, M203, (test launcher) is a lightweight, single shot, breech loading, pump action, shoulder fired weapon attached to the 5.56mm, M16/M16A1 Rifle. The launcher is loaded by inserting a 40mm round in the open breech and pulling the barrel rearward to the locked position. The pump operated mechanism is moved on two L-shaped rails on the underside of the weapon housing. The launcher is capable of firing all standard 40mm ammunition designed for a single shot weapon (ref 1, appendix I).

b. Armament Command (ARMCOM) supplied five improved test launchers, five M16A1 Rifles (support weapons), 5,184 rounds of 40mm M433, HEDP, ammunition, and a maintenance support package for the five test launchers.

c. The M433 High Explosive Dual Purpose (HEDP) ammunition (round) is made up of the M118 cartridge case and a projectile with a fragmenting body and a shaped charge (projectile). The projectile is detonated by a point initiating base detonating fuse M550 with a shaped charge lead.

d. The cartridge case and primer of the 40mm, M433, HEDP ammunition are identical to those of the M406, HE ammunition utilized in the arctic service test during FY71 (ref 1, appendix I).

e. Five thousand rounds of 40mm ammunition were expended during the test of the improved launcher. Sixty-nine rounds were expended in a supplemental evaluation of the ammunition's performance in deep snow. One hundred and fifteen rounds were turned in.

f. The five test launchers and support weapons and the maintenance support package were retained at ATC following test completion.

g. Photograph 1.1 shows the test launcher mounted on an M16A1 Rifle. Photograph 1.2 shows the 40mm, M433, HEDP round used for testing.

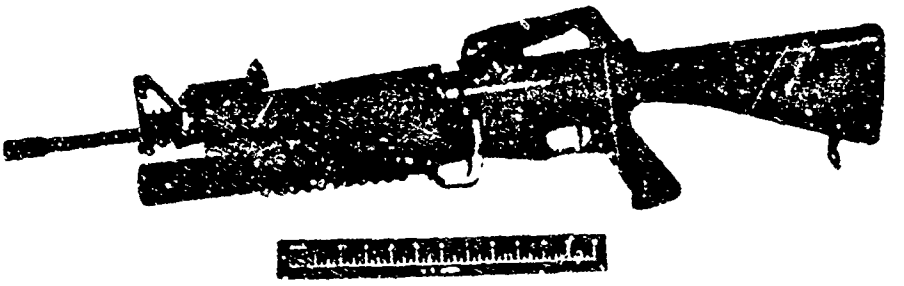


PHOTO 1.1.--Identification Photograph of M203 Grenade Launcher Attached to M16A1 Rifle

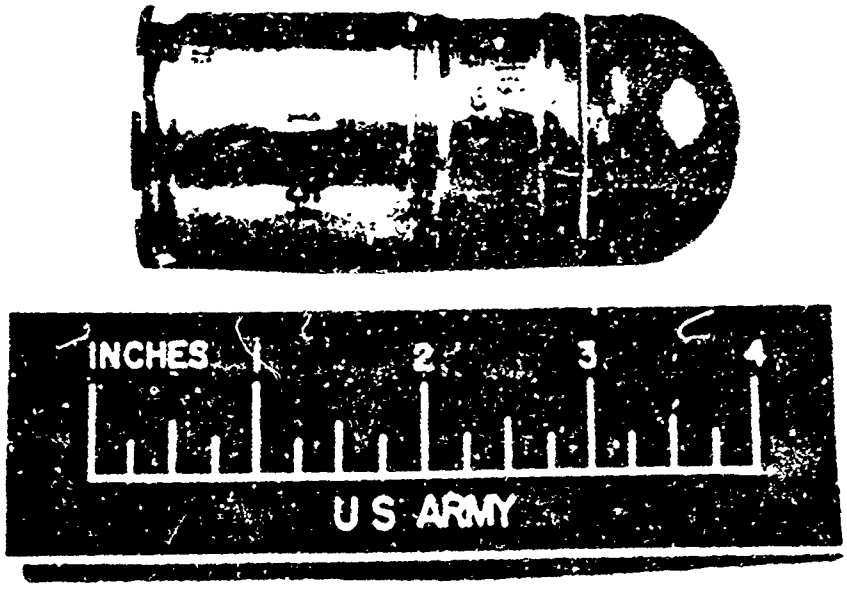


PHOTO 1.2.--Identification Photograph of 40mm, M433, HEDP, Ammunition used during Test

1.3 TEST OBJECTIVE

Evaluate improvements intended to correct the previously reported deficiencies related to guide rails, handgrips, and primer punchouts.

1.4 SCOPE

a. ATC conducted a check test of the improved Launcher, Grenade, 40mm, M203, from 20 November 1974 to 26 February 1975 under arctic winter conditions at Fort Greely, Alaska.

b. The test included the following subtests: Preoperational inspection, transportability and handling, maintenance evaluation,

reliability, and adequacy of corrective actions. Human factors, value engineering, and safety were addressed under the transportability and reliability subtests. The maintenance evaluation was restricted to a maintenance support package which included pertinent manuals and repair parts (ref 5, appendix I).

c. Although not within the scope of the test directive, certain cold weather performance characteristics of the M433, HEDP, ammunition were recorded incidental to evaluation of the test data and are reported for information.

d. Twenty-five percent (1250) of the total rounds used in testing (5000) were fired between -4°F and -25°F, 50 percent (2500) were fired between -26°F and -50°F, and 25 percent (1250) were fired between -51°F and -64°F. One thousand rounds were fired through each test launcher.

e. Testing was conducted in accordance with the ATC test plan dated 6 November 1974 (ref 5, appendix I).

f. The sample of five test launchers and 5000 rounds of ammunition used in this test were assumed to be representative of the total population of M203 Launchers and 40mm ammunition.

g. The sample size of 500 missions (10 rounds per mission) was determined to be sufficient to estimate mission reliability to within 6 percent of its true value at the 80 percent confidence level, assuming a binomial distribution of mission failures.

h. Prior to test initiation, the test team was given basic cold weather training and training in northern warfare operations to include ski and snowshoe instruction (ref 6, appendix I).

i. All test team members received training, to include firing, on unmodified M203 Grenade Launchers using M407 training ammunition, prior to being issued the test launchers (ref 7, appendix I).

j. All 40mm firing (training and firing phases of the test) was accomplished on the 40mm firing range at Fort Greely, Alaska (appendix H).

k. The test launchers and support weapons were stored in a heated, secure area except when required for testing. They were removed from storage early enough to insure at least 1 hour of cold soak at ambient temperature prior to firing. Ammunition was stored outdoors at ambient temperature in an approved ammunition storage area, except when required for testing, at which time it was transported to the firing range.

l. Equipment log books were established for each test launcher during preoperational inspection. The number of rounds fired, miles transported, equipment failures, and components repaired/replaced were recorded in the log book for each of the five test launchers.

m. Lubricating Oil Weapons (LAW) and rifle bore cleaner were the only lubricating and cleaning materials used during the test.

n. Maintenance evaluation personnel evaluated all maintenance, above operator level, performed on the test launcher. The test officer evaluated operator maintenance.

o. Soldiers participating in the test wore components of the cold-dry uniform (appendix F) during all phases of the test.

SECTION 2 - DETAILS OF TEST

2.1 PREOPERATIONAL INSPECTION

2.1.1 Objective

Determine if the test launchers, support weapons, maintenance support package, and ammunition are complete and in proper condition for testing.

2.1.2 Criterion

None.

2.1.3 Method

a. The test launchers and support weapons were inspected for defects or damage in accordance with TM 9-1010-221-24 (M203) (ref 8, appendix I) and TM 9-1005-249-20 (M16A1) (ref 9, appendix I).

b. The maintenance support package was inspected for defects or damage in accordance with TM 9-1010-221-24, and was inventoried against the maintenance support package checklist provided by the developer (Rock Island).

c. The 5,184, 40mm, M433, HEDP cartridges and primers were inspected and 5000 rounds were marked with control numbers 1 through 10 in groups of 1 - 500 (example: 2-50, 5-472) (see photo 2.1) prior to storage in the ammunition storage area.

d. Firing pin protrusion was measured in accordance with instruction provided by the developer (ref 10, appendix I).

e. ID photographs were taken of one test launcher attached to the M16A1 Rifle and one round of ammunition.

2.1.4 Results

a. The test launchers, support weapons, and maintenance support package were found to be complete and in proper condition for testing.

b. All primers on the 40mm ammunition appeared normal.

c. Firing pin protrusion was within prescribed tolerances (0.047 to 0.032 in.) as stated by the developer, (para 2.5.4c and ref 10, appendix I).

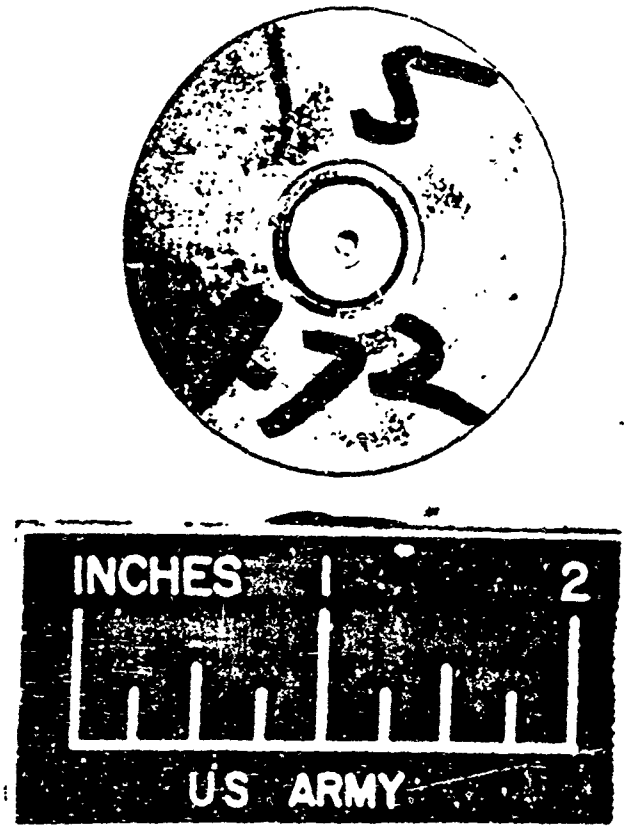


PHOTO 2.1.--40mm Cartridge Case Marked with Identification Number

2.1.5 Analysis

The test launchers, support weapons, maintenance support packages, and ammunition were in proper condition for testing.

2.2 TRANSPORTABILITY AND HANDLING

2.2.1 Objective

Determine the effects on the test launchers of transport and handling in the arctic.

2.2.2 Criterion

The test launcher must withstand rugged usage, to include violent jarring incurred as a soldier hits the ground, going from standing to the prone position while on the run, and normal rough handling incurred during shipment and combat situations (para 2b(2)(a), SDR).

2.2.3 Method

a. Five grenadiers wearing the appropriate cold-dry uniform transported the test launchers, at temperatures ranging from -4°F to -21°F, using the following six methods:

(1) Dismounted road march (5.1 miles).

(2) Snowshoe march over open and brush covered terrain (5.0 miles).

(3) Cross-country ski march (4.9 miles).

(4) Mechanized move in M113 Armored Personnel Carrier (5.1 miles).

(5) Skijoring behind M113 Armored Personnel Carrier (4.9 miles).

(6) Air assault (eagle flight) into and out of five landing zones/pickup zones using UH1H Helicopters (75 air miles).

b. During each transport exercise the grenadiers were required to dismount or move from their mode of transportation to a prone firing position (battle drill). After movement into the first prone firing position each grenadier simulated loading and firing the test launcher two to three times, then moved to a second prone firing position where the simulated firing was repeated. Ten battle drill exercises were conducted in conjunction with each of the six modes of transportation. Snow depth during these exercises varied from 2 inches to 18 inches. Details of snow depth and ambient temperatures during each exercise are contained in table 3.1, appendix A.

c. Ten rounds of 40mm ammunition were fired from each test launcher at the termination of each of the transportability exercises.

d. Mileage, by type of vehicle utilized to transport grenadiers and their weapons from the storage area to the firing range and back, was recorded and considered as additional data to evaluate transportability and handling of the test launchers (table 3.2, appendix A).

e. The grenadiers were observed by other test team members to determine if difficulties relating to human factors or safety existed in relation to transportability and handling of the test launchers.

2.2.4 Results

a. No detrimental effects occurred to the test launchers during the road march, ski march, and mechanized move in the M113 Armored Personnel Carrier.

b. During the skijoring exercise the rear aperture of one quadrant sight was broken off when the grenadier fell on his weapon while attempting to negotiate a slight turn to the right. His weapon was slung over his right shoulder when the fall occurred.

c. A total of five small plastic teeth were sheared off the graduated scale of two quadrant sights during the snowshoe march (two teeth from one weapon and three from another). This condition prevented locking the quadrant sight in place at ranges below 100 and 125 meters respectively.

d. The five test launchers were subjected to blowing snow from the helicopters during insertion and pickup from five LZ's while conducting the airmobile exercise. They were then subjected to temperatures warm enough to melt snow during flight to the next LZ. Thawing and refreezing of snow caused parts of the test launchers and support weapons to malfunction. The table 2.1 lists the parts of test launchers and support weapons that were inoperable during one or more of the simulated firing exercises.

TABLE 2.1.--Icing of Parts on Test Launchers And Support Weapons During Eagle Flight Exercises

Item Frozen - Weapon	Wpn. No. 1	2	3	4	5
1. Quadrant sight latch - M203	X	X	X	X	X
2. Safety - M203		X			X
3. Barrel Latch - M203			X	X	X
4. Safety - M16A1					X
5. Magazine release button - M16A1	X	X		X	X
6. Magazine Frozen to - M16A1	X	X		X	X
7. Barrel frozen to guide rails - M203			X	X	X

None of the icing caused failure of a test launcher to fire during the live firing phase. All five test launchers had to be fired without the use of quadrant sights which could not be manipulated (item 1, table 2.1) and the safety on two of the five test launchers could not be used because they were frozen in the "Fire" position (item 2, table 2.1).

If the test launchers had been required to fire live rounds rather than simulated firing after insertion into LZ 3, weapons 3 and 5 would not have fired. Weapon 4 would not have fired after insertion into LZ 4. When the firers of those weapons went into their first firing position and opened the barrel to simulate loading, the barrel latch froze open preventing the barrel from locking to the receiver when moved to the rear (item 3, table 2.1).

e. No damage occurred during transport of the test launchers between the storage area and the firing range.

f. Each test launcher successfully completed a firing mission (10 rounds) after each transportability exercise. One mission had to be fired without the use of quadrant sights (item 1, table 2.1). The grenadiers were sufficiently experienced to effectively engage their targets without the use of the quadrant sights.

g. There were no safety problems encountered with transport of the test weapons. Although two safeties were frozen during the exercises, no safety hazard existed since weapons are transported unloaded.

2.2.5 Analysis

a. The criterion was met.

b. Damage to the quadrant sight during the skijoring exercise was considered an isolated incident.

c. Damage to the plastic teeth of the quadrant sights was considered normal wear.

d. The problems encountered with ice-coated part stoppage are inherent in the use of any weapon in this environment and can be reduced through experience and training in cold weather operations.

2.3 MAINTENANCE EVALUATION

Maintenance data is included for information only, as shown in the Maintenance Analysis Chart, appendix D.

2.3.1 Equipment Publications

2 3.1.1 Objective

Determine if the publications received as a part of the maintenance test package are adequate for operation and maintenance of the improved launchers at the indicated maintenance level.

2.3.1.2 Criterion

Equipment publications contained in the maintenance test package will be complete, accurate, easy to read, consistent in nomenclature, simple to follow, and adequate to complete all phases of operation, all scheduled and unscheduled maintenance actions, and parts acquisition at all levels of maintenance (para 2-5c(2), AR 702-3).

2.3.1.3 Method

a. TM 9-1010-221-10 (ref 11, appendix I) was reviewed by the test team for completeness and understandability. TM 9-1010-221-24 was reviewed by maintenance personnel to determine the adequacy of maintenance instructions, Maintenance Allocation Charts, repair parts lists, and special tools and equipment lists.

b. All operations and maintenance required were performed in accordance with the appropriate publications to determine publication adequacy, completeness, simplicity, and clarity.

2.3.1.4 Results

a. Both of the publications reviewed were adequate for operation and maintenance of the test launcher at the operator and unit level.

b. The following recommended changes to the operator's manual, TM 9-1010-221-10, were reported on DA Form 2028:

(1) Additional instructions for use of the leaf sight should be added in the operator's manual to require that the M16A1 Rifle be zeroed prior to zeroing the leaf sight for the M203. This is necessary because use of the leaf sight requires the use of the adjustable front sight post of the M16A1.

(2) Additional instructions for use of the M203 Grenade Launcher in cold climates should be added to the operator's manual. The manual should state "When engaging targets at ranges greater than 250 meters at temperatures below 0°F, add 50 meters to the actual range to the target." This recommendation was based on observation of 2500 rounds fired at temperatures below 0°F at these ranges.

c The following recommended changes to the maintenance manual, TM 9-1010-221-24, were reported on DA Form 2028:

(1) All references to the special tool (wrench and gage combination) used with the launcher prior to modification of the firing pin should be deleted because subject tool is no longer compatible with the improved launcher.

(2) Instructions for maintenance of the receiver assembly should be added as present instructions are not compatible with the improved launcher.

d TM 9-1010-221-10 and TM 9-1010-221-24 now prescribe an overlap between temperatures of 0°F and -35°F wherein either LAW (Lubricating Oil, Weapons, FSN 9150-664-0038) or LSA (Lubricating Oil, Semi-Fluid, FSN 9150-889-3522) can be used. It was recommended that the manuals be changed to indicate a preference for the use of LAW within the overlap range. This recommendation was based on firing 5000 rounds at temperatures between -4°F and -64°F while using LAW and experiencing no failure or problems associated with lubrication. Rock Island Arsenal personnel reported experiencing lubricant related failures to fire at temperatures between 0°F and -35°F while using LSA as a lubricant on weapons being fired in a cold chamber.

2.3.1.5 Analysis

The criterion was not fully evaluated as maintenance instructions pertaining to the receiver assembly of the test launchers were not available. Changes were recommended to improve the operation and maintenance of the test launcher.

2.3.2 Repair Parts

2.3.2.1 Objective

Determine if the repair parts provided with the test launchers are adequate, necessary, and compatible for their intended purpose.

2.3.2.2 Criteria

a. Repair parts must be consistent with the Maintenance Allocation Chart (MAC) and Repair Parts Stockage List (RPSL) (TM 9-1010-221-24), where the tools and skills required to install and align the parts are authorized (para 2-5c(3), AR 702-3).

b. Repair parts which are used to maintain the test launchers must be interchangeable with like parts being replaced (para 2-5c(3), AR 702-3).

2.3.2.3 Method

Throughout the test, the test team and maintenance personnel observed and evaluated the installation of repair parts at operator and field maintenance levels. Repair parts were examined for interchangeability, compatibility, authorized maintenance level, ease of installation, and quantities as indicated in the Maintenance Allocation Chart (MAC).

2.3.2.4 Results

All repair parts used to support testing were interchangeable with original parts and are recorded on the Parts Analysis Chart, appendix D.

2.3.2.5 Analysis

The criteria pertaining to repair parts were met. Repair parts were consistent with the MAC and RPSL and were interchangeable with like parts being replaced.

2.3.3 Special Tools and Test Equipment

2.3.3.1 Objective

Evaluate all common and special tools used with the test launcher for their adequacy and need at their prescribed maintenance level.

2.3.3.2 Criterion

Special tools outlined in the maintenance literature and/or contained in the test maintenance package shall be necessary and adequate for the performance of all maintenance tasks at all levels when used in conjunction with the authorized common tools contained in the applicable tool kits. Common tools should be substituted for special tools whenever practical (para 2-5c(1), AR 702-3).

2.3.3.3 Method

Throughout the test, common tools used with the test launcher were evaluated to determine if they were adequate for the intended purpose and authorized at the prescribed maintenance level.

2.3.3.4 Results

a. Common tools were utilized for all repair actions and no requirement for special tools was identified.

b. The wrench adapter, torque is required for removal of the breech insert, however, this operation was not performed during the test.

2.3.3.5 Analysis

The criterion was not fully evaluated because the wrench adapter, torque was not utilized.

2.4 RELIABILITY

2.4.1 Objective

Determine the reliability of the test launchers.

2.4.2 Criterion

(Essential) The launcher should have a 95 percent (desired 99 plus percent) probability of completing a firing mission (para 2b(3)(a), SDR).

2.4.3 Method

a. All rounds used for reliability determinations were fired from the firing line on the 40mm firing range (appendix H). A firing mission consisted of the expenditure of 10 rounds of ammunition. Two hundred twenty-five missions were fired at a rapid rate of fire (10 rounds in 2 minutes) beginning with the test launcher locked and loaded. The remaining 275 missions were fired at a slow rate of fire (approximately one round every 30 seconds). The following table depicts the number of rounds fired, rate of fire, and temperature range at which fired.

TABLE 2.2.--Firing Mission Rounds Expended by Temperature and Type Mission

Temperature (°F)	Rapid	Slow	Total
-4 to -25	550*	700	1250
-26 to -50	1150	1350	2500
-51 to -64	550	700	1250
TOTAL	2250	2750	5000

*300 of these rounds were fired during the transportability and handling subtest.

b. Fifty percent of the targets were engaged at 150 to 200 meters. The remainder were engaged at 250 to 350 meters.

c. All expended cartridge cases and any residue were ejected into a box lined with target cloth on the firing line (photo 2.2). The expended cartridge cases and residue were examined after each 10-round group (one firing mission) was fired.

d. A firing report data sheet (appendix G) was completed after each 10-round group was fired.

PHOTO 2.2.--Expended 40mm Cartridge Case Being Ejected into Box

2.4.4 Results

a. The average time to fire a 10-round rapid fire mission was 1 minute and 16 seconds. For a breakdown of the times of each firer by temperature categories see table 3.3, appendix A.

b. No hangfires or misfires occurred in the 5000 rounds fired.

c. Information on duds, low order detonations, late detonations (skips), and projectiles that fell short of the targets are contained in para 2.6.4.

d. All primers functioned normally and no primer punchouts occurred. For information on high pressure chamber fractures and blowouts see para 2.6.4.

e. During conduct of firing exercises, grenadiers wearing the arctic mitten shell, with trigger finger, found it was easier and faster to fire the test launcher when using a 30-round magazine in the support weapon than when using a 20-round magazine, because it provided a better handhold (photo 2.3 and 2.4).

f. All firing missions were successful and there were no safety comments relative to this subtest.

2.4.5 Analysis

During the test, no test launcher reliability failures were observed out of a sample size of 500 missions. The true reliability for a success/failure type mission, with 90 percent confidence, was at least 0.9954. The underlying mission failure distribution was assumed to be binomial.

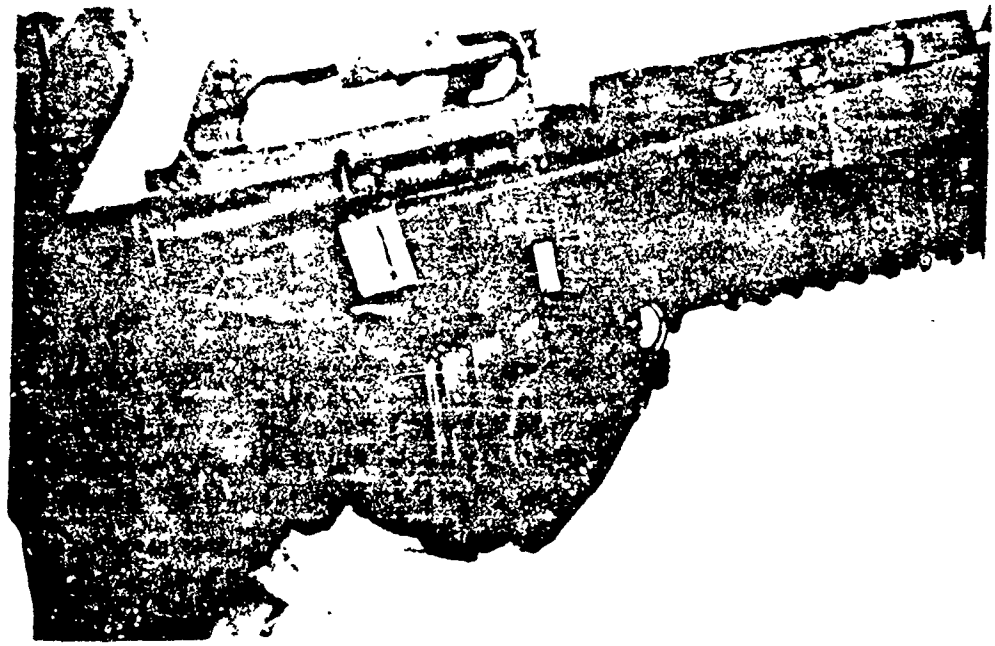


PHOTO 2.3.--Firing the M203 Grenade Launcher With 20-Round Magazine in M16A1

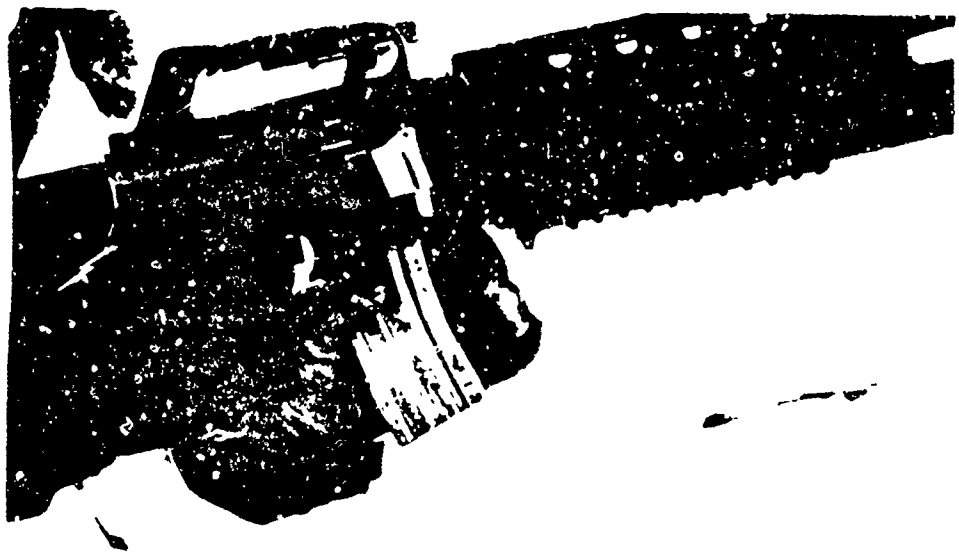


PHOTO 2.4.--Firing the M203 Grenade Launcher With 30-Round Magazine in M16A1

2.5 ADEQUACY OF CORRECTIVE ACTIONS

2.5.1 Objective

Determine if the previously reported deficiencies related to guide rails, handgrips, and primer punchouts have been corrected.

2.5.2 Criterion

None.

2.5.3 Method

Data for this subtest was collected during the conduct of preoperational inspection, transportability and handling, and reliability subtests.

2.5.4 Results

a. There were no failures or difficulties encountered with guide rails or handgrips during the conduct of the test.

b. There were no primer punchouts encountered during the test where 1000 rounds were fired from each of the five test launchers.

c. Firing pin protrusion on all test launchers was found to be within tolerances set by Rock Island (ref 10, appendix I) and did not change throughout the test.

2.5.5 Analysis

The previously reported deficiencies related to guide rails, handgrips, and primer punchouts were corrected.

2.6 EVALUATION OF M433 HEDP AMMUNITION PERFORMANCE

2.6.1 Objective

Report performance characteristics of the 40mm, M433, HEDP ammunition observed during conduct of this check test.

2.6.2 Criterion

None.

2.6.3 Method

a. The Arctic Test Center received 5,184 cartridges, 40mm, M433,

HEDP Ammunition, lot no MA 154-54 on 15 Nov 74 from Milan Army Ammo Plant, Milan, Tennessee (ref photo 1.2).

b. The rounds were placed in environmental storage on 20 Nov 74 and were subjected to ambient temperatures of 39°F to -64°F, and fired at temperatures ranging from -4°F to -64°F.

c. During the conduct of the reliability and transportability and handling subtests, the following performance characteristics were recorded.

(1) Blowouts or fractures to the forward portion of the high pressure chamber of the cartridge case loading assembly, M118.

(2) Low order detonations.

(3) Late detonation (skips) where the M433 projectile hit and bounced one, two, or three times before it exploded.

(4) Duds.

d. The 5000 rounds fired during the test were impacted on a range of frozen gravel or ice with less than 3 inches of snow or on a vertical metal target. Upon completion of scheduled testing, 69 rounds were fired into soft snow at three depths: 6 to 8 inches, 10 to 12 inches, and 16 to 18 inches. These 69 rounds were fired at a range of 200 meters and at an ambient temperature of -10°F.

e. At the beginning of firing, both sights (leaf and quadrant) were zeroed at 200 meters range in ambient temperatures between -10°F and -12°F. Subsequent firing at ranges of 250 meters and beyond resulted in rounds falling short of the target. At that time grenadiers were instructed to add 50 meters to their sight setting for all firing at these ranges.

2.6.4 Results

a. The high pressure chamber of 45 of the 5000 cartridge cases, M118 blew out (photo 2.5) or fractured (photo 2.6).

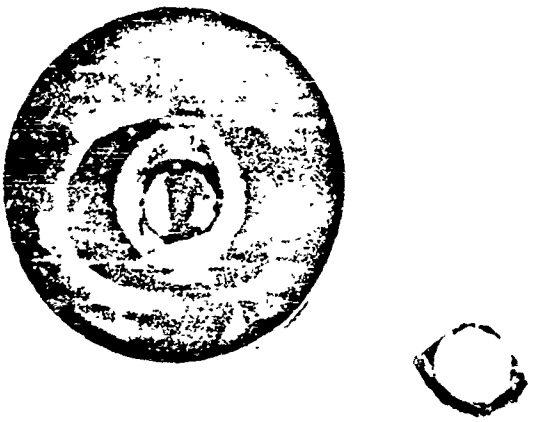


PHOTO 2.5.--M118 Cartridge Case Showing Fragment of High Pressure Chamber which Blew Out

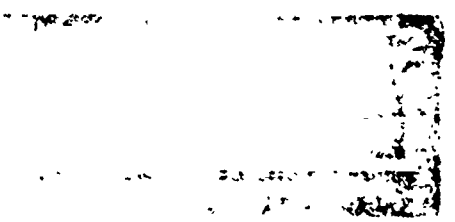


PHOTO 2.6.--M118 Cartridge Case with Fractured High Pressure Chamber

The following table depicts the number of high pressure chamber blowouts or fractures at three temperature ranges in which the rounds were fired.

TABLE 2.4.--40MM, M433, HEDP High Pressure Chamber Fractures or Blowouts

Temperature (°F)	Rounds Fired	Fractures and Blowouts
-4 to -25	1250	12
-26 to -50	2500	24
-51 to -64	1250	9
TOTAL	5000	45

In one instance, a fragment (photo 2.5) was observed to travel down range from the muzzle of the weapon 5.5 meters, approximately 20 degrees left of the gun-target line. This fragment had insufficient velocity to be harmful. All but one of the projectiles functioned on impact and all appeared to have a normal trajectory and range.

b. The following tables depict the number of rounds fired at three temperature groups and show the number of low order detonations, the number of late detonations (projectiles that exploded on the second or third bounce (skip)), and the number of duds at the four ranges fired.

TABLE 2.5.--40MM, M433, HEDP Low Order Detonations

Temperature Range (°F)	Low Order/No. Rounds Fired by Range (Meters) 150	200	200*	250	300
-4 to -25	3/330	1/260	0/40	3/230	6/390
-26 to -50	NF	22/870	0/380	NF	36/1250
-51 to -64	NF	18/570	0/80	NF	22/600

NF: Not Fired.
* Rounds functioned against vertical metal surfaces. Remaining rounds impacted on frozen ground or ice.

TABLE 2.6.--40MM, M433, HEDP
Late Detonations (Skips)

Temperature Range (°F)	Skips/No. Rounds Fired by Range (Meters) 150	200	200*	250	300
-4 to -25	0/330	0/260	0/40	1/230	6/390
-26 to -50	NF	4/870	0/380	NF	0/1250
-51 to -64	NF	7/570	0/80	NF	12/600

NF: Not Fired.
* Rounds functioned against vertical metal surfaces. Remaining rounds impacted on frozen ground or ice.

TABLE 2.7.--40MM, M433, HEDP Duds

Temperature Range (°F)	Duds/No. Rounds Fired by Range (Meters) 150	200	200*	250	300
-4 to -25	6/330	6/260	2/40	0/230	3/390
-26 to -50	NF	13/870	7/380	NF	32/1250
-51 to -64	NF	39/570	4/80	NF	38/600

NF: Not Fired.
* Projectiles functioned against vertical metal surfaces. Remaining projectiles impacted on frozen ground or ice.

d. Table 2.8 shows number of rounds fired, number of high order explosions, number of rounds that failed to detonate (duds) and the snow depth at the impact area.

TABLE 2.8.--Results of Soft Snow Firing Test
Using 40MM, M433, HEDP Rounds

Snow Depth (Inches)	Rounds Fired*	Detonations	Duds
6 to 8	25	16	9
10 to 12	25	17	8
16 to 18	15	4	11

* Four additional rounds were fired but were considered "no test" due to striking trees before impact.

e. When using the 50 meter sight conversion at ranges of 250 meters and beyond, grenadiers were able to successfully engage their targets.

2.6.5 Analysis

a. Comparisons amoung data groups were accompiished using the chi-square test.

TABLE 2.9.--Consolidated Table of High Pressure Chamber Fractures, Duds, Low Order Detonations, and Late Detonations

	Rounds	Failures	Percent
High pressure chamber fractures or blowouts.	5000	45	0.9
Duds (against armor, 0°F to -25°F).	40	2	5.0
Duds (0°F to -50°F, excluding previous set)	3710	67	1.8
Duds (-51°F to -64°F)	1250	81	6.5
Duds (6 to 12 inches of snow)	50	17	34.0
Duds (16 to 18 inches of snow)	15	11	73.3
Low order detonations (against armor, all temperatures)	500	0	0.0
Low order detonations (0°F to -25°F)	1210	13	1.1
Low order detonations (-25°F to -64°F)	3290	98	3.0
Late detonations (300 meters, 0°F to -25°F)	390	6	1.5
Late detonations (0°F to -50°F, excluding previous set)	3360	5	0.1
Late detonations (-51°F to -64°F)	1250	19	1.5

b. There was no significant difference between failure rates in the three temperature ranges for high pressure chamber fractures or blowouts.

c. The dud rate for projectiles fired against armor (APC hull) was significantly higher (at the 5 percent level) than the dud rate for projectiles impacted on the ground in the temperature range of 0°F to -25°F.

d. The dud rate for rounds fired at temperatures below -50°F was significantly higher (at the 5 percent level) than the dud rate for rounds fired at temperatures between 0°F and -50°F (excluding rounds fired against armor between 0°F and -25°F).

e. The dud rate for projectiles impacting into 6 to 12 inches of snow was significantly higher (at the 5 percent level) than the dud rate for projectiles impacting bare ground. The dud rate for projectiles impacting into 16 to 18 inches of snow was significantly higher (at the 5 percent level) than the dud rate for rounds impacting into 6 to 12 inches of snow and bare ground.

f. The low order detonation rate for rounds fired against armor (APC Hull) was significantly lower (at the 5 percent level) than the low order detonation rate for rounds impacted on bare ground.

g. Excluding rounds fired against armor, the low order detonation rates for rounds fired at temperatures below -26°F was significantly higher (at the 5 percent level) than the low order detonation rate for rounds fired at temperatures between 0°F and -25°F.

h. The skip rate for rounds fired at 300 meters range at temperatures between 0°F and -25°F was significantly higher (at the 5 percent level) than the skip rate for rounds fired at all other ranges at temperatures between 0°F and -50°F. The skip rate for rounds fired at temperatures below -50°F was significantly higher (at the 5 percent level) than the skip rate for rounds fired at temperatures between 0°F and -50°F.

i. The combined skip and dud rate indicated a decreasing probability of proper functioning with decreasing temperature, becoming particularly evident at temperatures below -50°F. This condition may be indicative of decreased fuze sensitivity or of irregular explosive initiation at low temperatures.

j. When engaging targets at ranges of 250 meters or greater, at temperatures below 0°F, 50 meters should be added to the actual range to the target for effective engagement of targets under field conditions.

SECTION 3 - APPENDICES

APPENDIX A - TEST DATA

TABLE 3.1.--Temperature and Average Snow Depth For Transportability and Handling Exercises

Transport	Start Temp. (°F)	Finish Temp. (°F)	BATTLE DRILL EXERCISES 1 Snow Depth (In)	2 Snow Depth (In)	3 Snow Depth (In)	4 Snow Depth (In)	5 Snow Depth (In)
Dismounted Road March	-20	-8	8	10	10	13	13
Snowshoe March	-13	-5	16	18	17	12	15
Ski March	-10	-4	18	15	17	8	10
Skijoring (M113)	-9	-5	15	15	10	16	6
Mechanized (M113)	-21	-16	9	8	6	7	1
Airmobile (Eagle Flight)	-16	-10	6	9	3	8	2

TABLE 3.2.--Miles by Type of Transport for Test Launchers

MEANS OF TRANSPORT	Miles
Dismounted Road March	5.1
Snowshoe March	5.0
Ski March	4.9
Skijoring (M113)	4.9
Airmobile (UH1H)	75 (Air Miles)
Mechanized (M113)	5.1
Truck, Chevrolet Carryall (TMP)	48.0
Truck, 3/4-Ton, M37B1	84.0*
Truck, 1 1/4-Ton, M725 (Ambulance)	42.0
Truck, 2 1/2-Ton, M35A1	5.0
APC, M113	25.4
TOTAL	304.4

* Weapon no. 1 was transported 18.0 miles less in the 3/4-ton truck than weapons 2 - 5 for a total mileage of 286.4.

TABLE 3.3.--Results of Timed Fire Exercise*

	TEMPERATURE			
	-4°F to -25°F	-26°F to -50°F	-51°F to -64°F	Total
Firer No. 1				
Rounds Fired	110 Rounds	270 Rounds	110 Rounds	490 Rounds
Minimum Time	1:04	:57	1:01	:57
Maximum Time	1:29	1:44	1:45	1:45
Average Time	1:19	1:16	1:15	1:16
Std. Deviation	0:08	0:11	0:12	0:11
Firer No. 2				
Rounds Fired	110 Rounds	270 Rounds	110 Rounds	490 Rounds
Minimum Time	1:08	1:05	:58	:58
Maximum Time	1:46	1:42	1:34	1:46
Average Time	1:26	1:21	1:15	1:21
Std. Deviation	0:14	0:11	0:11	0:12
Firer No. 3				
Rounds Fired	110 Rounds	270 Rounds	110 Rounds	490 Rounds
Minimum Time	:57	:45	:45	:45
Maximum Time	1:55	1:17	1:40	1:55
Average Time	1:24	:57	1:07	1:06
Std. Deviation	0:17	0:08	0:19	0:17
Firer No. 4				
Rounds Fired	110 Rounds	270 Rounds	110 Rounds	490 Rounds
Minimum Time	1:02	1:02	:55	:55
Maximum Time	1:39	1:45	1:45	1:45
Average Time	1:26	1:18	1:18	1:20
Std. Deviation	0:11	0:13	0:13	0:13
Firer No. 5				
Rounds Fired	110 Rounds	270 Rounds	110 Rounds	490 Rounds
Minimum Time	1:00	:54	1:00	:54
Maximum Time	1:35	1:32	1:33	1:35
Average Time	1:17	1:14	1:13	1:14
Std. Deviation	0:11	0:09	0:11	0:10
TOTAL (All Five Firers)				
Rounds Fired	550 Rounds	1350 Rounds	550 Rounds	2450 Rounds
Minimum Time	:57	:45	:45	:45
Maximum Time	1:55	1:45	1:45	1:55
Average Time	1:22	1:45	1:14	1:16
Std. Deviation	0:13	0:13	0:14	1:14

*Time in Min:Sec

APPENDIX B - TEST FINDINGS

Item	Source	Criteria	Applicable Subtest/Evaluation	Remarks
1.	Para 2b(2)(a), SDR	Test launcher must withstand rugged usage to include violent jarring incurred as a soldier hits the ground, going from standing to prone position while on the run, and normal rough handling incurred during shipment and combat situations.	2.2	Met - para 2.2.5a
2.	Para 2-5c(2), AR 702-3	Equipment publications contained in the maintenance test package will be complete, accurate, easy to read, consistent in nomenclature, simple to follow, and adequate to complete all phases of operation, all scheduled and unscheduled maintenance actions, and parts acquisition at all levels of maintenance.	2.3.1	Not fully evaluated, no maintenance instructions provided, para 2.3.1.5
3.	Para 2-5c(3), AR 702-3	Repair parts must be consistent with the maintenance allocation chart (MAC) and repair parts stockage list (RPSL), when the tools and skills required to install and align the parts are authorized.	2.3.2	Met - para 2.3.2.5
4.	Para 2-5c(3), AR 702-3	Repair parts which are used to maintain the improved launchers must be interchangeable with like parts being replaced.	2.3.2	Met - para 2.3.2.5

Item	Source	Criteria	Applicable Subtest/Evaluation	Remarks
5.	Para 2-5c(1), AR 702-3	Special tools outlined in the maintenance literature and/or contained in the test maintenance package shall be necessary and adequate for the performance of all required maintenance tasks at all levels when used in conjunction with the authorized common tools contained in the applicable tool kit. Common tools should be substituted for special tools whenever practical.	2.3.3	Not fully evaluated, one special tool provided but not used, para 2.3.3.5
6.	Para 2b(3)(a), SDR	(Essential) The launcher should have a 95 percent (desired 99 plus percent) probability of completing a firing mission.	2.4	Met - para 2.4.5b

APPENDIX C - DEFICIENCIES, SHORTCOMINGS, AND SUGGESTED IMPROVEMENTS

1. Corrected Previous Deficiencies

Deficiency - Previous Test	Corrective Action	Remarks
1. Fracture of the guide rails during firing.	Corrected by developer by strengthening guide rails.	No failures during test.
2. Failure of adhesive bond between handguard and barrel.	Corrected by developer by using an improved Epoxy to bond handguard to barrel.	No failures during test.
3. Primer punchout.	Corrected by developer by redesigning the tip of the firing pin and modifying parts of the receiver.	No failures during test.

APPENDIX D - MAINTENANCE EVALUATION

MAINTENANCE ANALYSIS CHART		PROJECT NO. 8-WE-300-203-019		NOMENCLATURE Launcher, Grenade, 40mm, M203						IDENTIFICATION NO. 77697, 76873, 76824, 77667, 76915
GP NO. (seq no.)	COMPONENT AND RELATED OPERATIONS	MAINTENANCE LEVEL C - Operator/Crew O - Org F - Direct H - General		TM INSTRUCTIONS		ACTIVE MAINTENANCE TIME		SYSTEM LIFE H - Hours M - Miles R - Rounds	REASON PERFORMED	REMARKS NC - Nonchargeable failure NA - Failure not addressable NI - Not included in active maintenance time
		Presh	Recm	Adot	In-adot	Clock Hours	Man-Hours			
1	2	3	4	5	6	7		8	9	10
(1)	Performed: Initial Inspection (All)	None	None	X		2.3	16.1	0-R	Scheduled	EPR KC-1 (NI)
4(2)	Replaced: Quadrant Sight (77697)	O	O	X		0.1	0.1	220-R	Unscheduled	EPR KC-3 (NC)
0(3)	Replaced: Rivet, Tubular (Sling swivel to swivel mount) (76873)	O	O	X		0.1	0.1	650-R	Unscheduled	EPR KC-6S1 (NC)

STEAC-MT-MEB Form 123
4 May 72 (This supersedes STEAC-MT-MEB, dated 25 Mar 71 which is obsolete)

PARTS ANALYSIS CHART	PROJECT NO 8-WE-300-203-019	NOMENCLATURE Launcher, Grenade, 40mm, M203				IDENTIFICATION NO 77697, 76873
GP NO (sp-1 no)	FEDERAL STOCK NUMBER	NOUN NOMENCLATURE	MAINTENANCE LEVEL C - Operator/Crew O - Org F - Direct H - General		PART LIFE H - Hours M - Miles R - Rounds	REASON USED	REMARKS
			Presb	Recm			
1	2	3	4	5	6	7	8
0(3)	5320-055-3066	Rivet, Tubular, Oval Head	0	0	6[illegible]-R	Unscheduled	EPR KC-6S1, SN 76873
4(2)	1010-483-1155	Sight Assembly, Quadrant	0	0	220-R	Unscheduled	EPR KC-3, SN 77697

D-2

STEAC-MT MEB Form 303
4 May 72 (This supersedes STEAC-MT-MEB 303, dated 25 Mar 71 which is obsolete)

MAINTENANCE PACKAGE LITERATURE CHART	PROJECT NO. 8-WE-300-203-019	NOMENCLATURE Launcher, Grenade, 40mm, M203

MANUSCRIPT			DATE RECEIVED		EVALUATION		FORM 2028	
NUMBER	QTY	TITLE	LIT	MATERIEL	ADQT	INADQT	DATE FORWARDED	REMARKS
1	2	3	4	5	6	7	8	9
TM 9-1010-221-10	2	Operator's Manual, 40mm Grenade Launcher, M203	18 Nov 75	18 Nov 75	X		18 Feb 75	EPR KC-9
TM 9-1010-221-24	2	Org, DS, GS Maintenance Manual for Launcher, Grenade, 40mm, M203 w/E incl RPSL	18 Nov 75	18 Nov 75	X		4 Mar 75	EPR KC-10

STEXC-MT-EH Form 128
2 October 1970

APPENDIX E - CRITICAL ISSUES

NOT USED

APPENDIX F - COLD-DRY UNIFORM

The year-round temperature variation peculiar to the arctic prohibits the prescribing of a particular uniform for any season. The clothing which is comfortable at -50°F becomes uncomfortable at -10°F and vice versa. Since the large fluctuation is experienced on an hour-by-hour, day-by-day basis, some degree of flexibility in uniform requirements is necessary.

Since material tested under arctic winter conditions is expected to function under the most adverse conditions, the uniform worn by operating personnel must also be suitable for the most adverse conditions. Accordingly, the "cold-dry uniform" referred to in this report consists of clothing components of both the cold-wet and cold-dry uniforms prescribed for this environment. The necessary clothing components of the cold-dry uniform were worn as defined in TM 10-275, DA, "Cold Weather Clothing and Sleeping Equipment, dated April 1968".

a. Undershirt mans, cotton, wool, full sleeve.

b. Drawers mans, cotton, wool, knit, ankle length.

c. Socks mans, wool, cushion sole, OG 408, stretch type.

d. Suspenders trousers, scissor back type.

e. Shirt mans, wool, nylon, flannel, OG 108.

f. Trousers cold weather, field, nylon and cotton.

g. Liner trousers, arctic mohair wool frieze.

h. Liner, cold weather trousers, field.

i. Trousers, snow camouflage, white arctic, M-65.

j. Boot insulated cold weather, mans rubber white, w/release valve.

k. Coat mans, cotton and nylon wind resistant sateen, 8.5 oz, OG 107.

l. Liner coat mans, nylon quilted, 6.2 oz, OG 106.

m. Parka mans, extreme cold weather, nonreversible, OG 107, wo/hood.

n. Liner parka mans, nylon quilted, 6.2 oz, OG106.

o. Cap insulating helmet, liner-helmet cotton nylon oxford, OG 107.

p. Hood winter, cotton and nylon oxford, OG 107, w/drawcord and fur ruff.

q. Handwear:

(1) Mitten set arctic: Gauntlet style shell w/leather palm.

(2) Mitten shells: Trigger finger leather palm and thumb with wool inserts.

(3) Glove shells, work, leather with wool inserts.

(4) Gloves cloth, work-type (anticontact).

r. Special-purpose clothing items:

(1) Over white uniform components.

(2) Mask: Extreme cold weather, nylor, wool, and rayon felt.

(3) Dickey, OG 108 (distinctive item of wear for ATC).

(4) Helmet, cover, camouflage, white (distinctive item of wear for test team).

s. Load Bearing Equipment:

(1) Belt, Pistol.

(2) Suspenders, Field.

(3) Pouch, Ammo - 2 EA.

(4) Kit, First Aid.

(5) Case, Accessory - Small Arms.

APPENDIX G - TEST DATA SHEET

FIRING REPORT, 40mm, M433, HEDP

Lot No. _____ Time for 10 Rounds _____ Slow Fire ☐
Group No. _____ Number of Particles _____
Range 150 ☐ 250 ☐ Firing Pin Protrusion _____
DATE: _____ TIME: _____ TEMPERATURE: _____

WEATHER CONDITION: CLEAR ☐ CLOUDY ☐ ICE FOG ☐ LIGHT SNOW ☐
HEAVY SNOW ☐ BLOWING SNOW ☐ OTHER _____

WIND: CALM ☐ SPEED _____ DIRECTION FROM _____

VISIBILITY: GOOD ☐ FAIR ☐ POOR ☐

FIRER'S NAME _____ RANK _____

FIRING POINT _____ WEAPON NO _____

ROUND	NORMAL	HANG-FIRE	MIS-FIRE	DUD	SHORT 50%	PRIMER	NORMAL	CHIPPED	PUNCHED
1	☐	☐	☐	☐	☐	1	☐	☐	☐
2	☐	☐	☐	☐	☐	2	☐	☐	☐
3	☐	☐	☐	☐	☐	3	☐	☐	☐
4	☐	☐	☐	☐	☐	4	☐	☐	☐
5	☐	☐	☐	☐	☐	5	☐	☐	☐
6	☐	☐	☐	☐	☐	6	☐	☐	☐
7	☐	☐	☐	☐	☐	7	☐	☐	☐
8	☐	☐	☐	☐	☐	8	☐	☐	☐
9	☐	☐	☐	☐	☐	9	☐	☐	☐
10	☐	☐	☐	☐	☐	10	☐	☐	☐

MISSION: SUCCESS ☐ REMARKS:
FAILED ☐
TBD ☐

SAFETY COMMENT ☐

HUMAN FACTORS COMMENT ☐

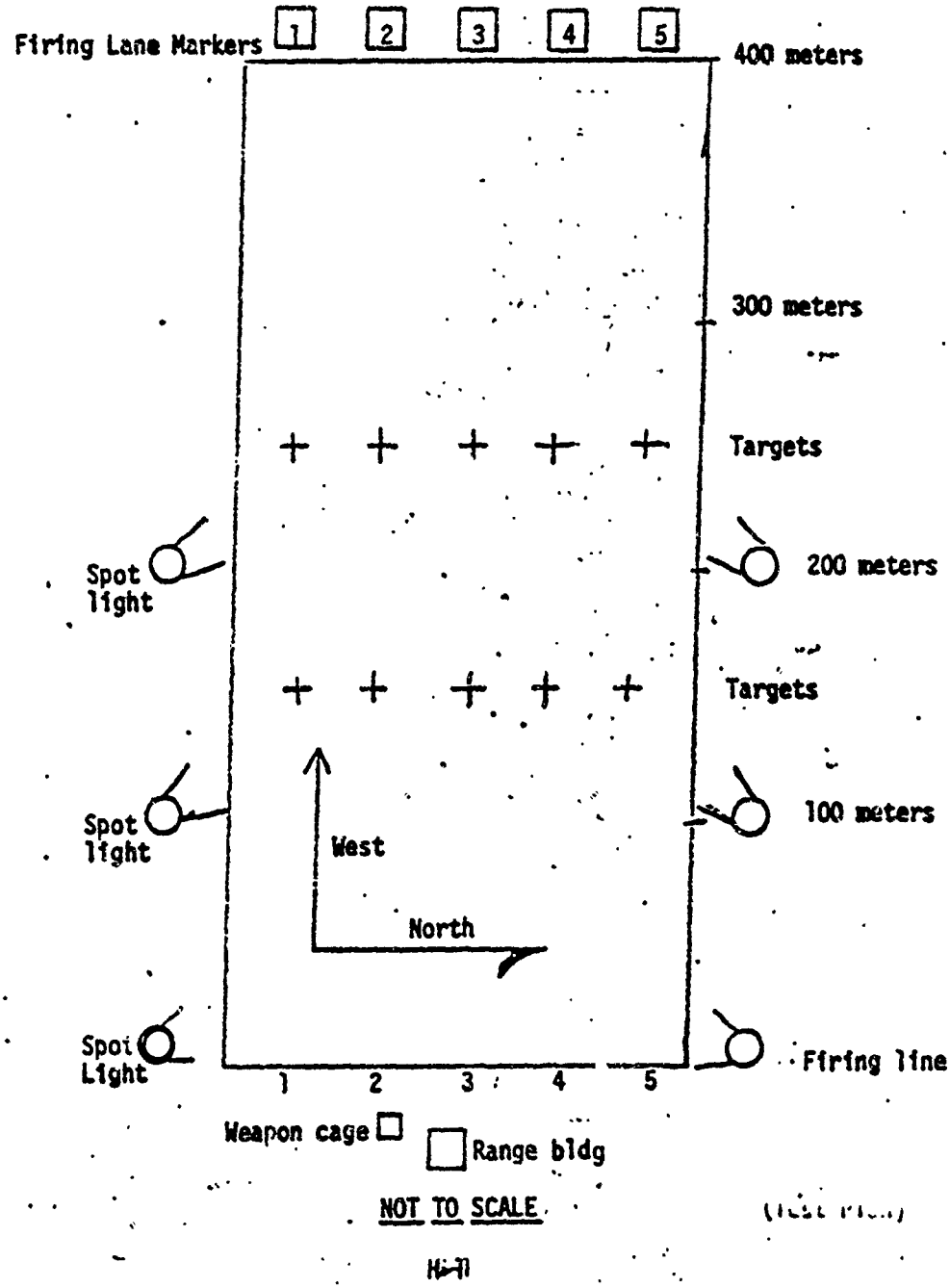
SAFETY OBSERVER _____ RECORDER _____

STEAC-MTD FORM 83 (Temp)
1 Nov 74

STEAC-WB
(Test Plan)

APPENDIX H - 40mm FIRING RANGE

Location: Arkansas General Purpose Range, Fort Greely, Alaska



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APPENDIX I - REFERENCES

1. Letter, U.S. Army Arctic Test Center, STEAC-PL-TSA, 5 Aug 71, subject: Final Report of Service Test of Launcher, Grenade, 40mm, M203, Attachment for Rifles, under Arctic Winter Conditions, USA TECOM Project No 8-WE-300-203-002.

2. Letter, U.S. Army Arctic Test Center, STEAC-PL-TS, 1 Mar 73, subject: Letter Report of Check Test of Launcher, Grenade, 40mm, M203, under Arctic Winter Conditions, TECOM Project No. 8-WE-300-203-015.

3. Letter, HQ TECOM, AMSTE-IN, dated 30 Sep 74, subject: Test Directive for Check Test of Launcher, Grenade, 40mm, M203 under Arctic Winter Conditions, TECOM Project No. 8-WE-300-203-019.

4. Telephone or verbal conversation record, DA Form 751, subject: M203 Grenade Launcher, dated 30 Oct 74. Conversation between MAJ Owen (Test Officer - M203), WTB, USAATC, and Mr. Thomas E. Dee, Jr. In Mat Testing Direc, USATECOM.

5. Test Plan, Check Test of Launcher, Grenade, 40mm, M203, under Arctic Winter Conditions, TECOM Project No. 8-WE-300-203-019, dated 6 Nov 74.

6. FM 31-70, Basic Cold Weather Manual, April 1968.

7. FM 23-31, 40mm Grenade Launchers, M203 and M79, May 1972.

8. TM 9-1010-221-24, Organizational, DS, GS Maintenance Manual for Launcher, Grenade, 40mm, M203, March 1972.

9. TM 9-1005-249-20, Organizational Maintenance Manual, Rifle, M16/M16A1, September 1971.

10. Record of telephone conversation, dated 15 Nov 74, between Major Woytek (ATC) and Mr. Stewart (ARMCOM, Rock Island), subject: Check Test - M203 Grenade Launcher.

11. TM 9-1010-221-10, Operator's Manual, 40mm Grenade Launcher, M203, February 1972.

12. AR 702-3, Army Materiel Reliability, Availability, and Maintainability (RAM).

13. Letter, CDCMR-W, CDC, 13 Jun 1967, subject: DA Approved Small Development Requirements for a 40mm Detachable Launcher for Individual Weapons.

14. Letter, U.S. Army Arctic Test Center, STEAC-MT, 5 Mar 1975, subject: Supplemental Information on Cartridge, 40mm, HEDP, M433.

APPENDIX J - ABBREVIATIONS

NOT USED

APPENDIX K - DISTRIBUTION LIST

Distribution denoted by an asterisk (*) will be made from those copies forwarded to Headquarters, TECOM. EPR distribution instructions are attached to this list. No foreign distribution is authorized by this HQ.

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